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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/104,297	06/24/1998	RICHARD JAMES HUMPLEMAN	2810-044	4083

7590 05/13/2005

KENNETH L. SHERMAN, ESQ.
SHERMAN & SHERMAN
2029 CENTRY PARK EAST
SUITE 1000TH FLOOR
LOS ANGELES, CA 90067

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EXAMINER	
BASHORE, WILLIAM L	
ART UNIT	PAPER NUMBER
2176	

DATE MAILED: 05/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/104,297	HUMPLEMAN ET AL.	
	Examiner	Art Unit	
	William L. Bashore	2176	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *1/13/2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) *21-33* is/are withdrawn from consideration.

5)☒ Claim(s) *34-36* is/are allowed.

6)☒ Claim(s) *1, 3-20* is/are rejected.

7)☒ Claim(s) *2* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4/11/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to communications: amendment filed 1/13/2005, to the original application filed 6/24/1998, with provisional application filing dates of 9/22/1997, and **6/25/1997**. Applicant swears behind the date of **6/10/1997**.

2. The examiner acknowledges Applicant's election of Group I (claims 1-20), filed 5/7/2004 with traverse. It is respectfully noted that since Applicant provides no argument in support of traverse, the examiner interprets this as an election without traverse.

3. Claims 1, 3-4, 6, 8 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Venkatraman and Hanson.

4. Claims 5, 7 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Venkatraman, Hanson, and Reber.

5. Claims 9-20 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Venkatraman, Hanson, and Suzuki.

6. Claims 1-36 pending. Claims 21-33 remain withdrawn from examination on the merits. Claims 34-36 have been added. Claims 1, 16, 20, 34 are independent claims.

Allowable Subject Matter

7. **Claims 34, 35, 36** are allowed.

8. **Claim 2** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 103

9. **The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:**

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. **Claims 1, 3-4, 6, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Venkatraman et al. (hereinafter Venkatraman), U.S. Patent No. 5,956,487 issued September 1999, in view of Hanson, U.S. Patent No. 6,148,346 issued November 2000.**

In regard to independent claim 1, Venkatraman teaches a home automation network comprising an interface for accessing connected home devices (Venkatraman Figure 3, column 3 lines 27-33; compare with claim 1 "*A method for providing....comprising the steps of*").

Venkatraman does not specifically teach a "*device list file*" associated with connected home devices. However, Hanson teaches a GUI displaying an object list (file) of available network devices (Hanson Figure 5, column 5 lines 36-40; compare with claim 1 "*generating a device list file....wherein the device list file identifies home devices that are currently connected to the home network*", and "*identified in the device list file*"). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Hanson to Venkatraman's web page generation, because of Hanson's taught advantage of itemizing, so as to provide Venkatraman the benefit of indicating to a user all available devices on a network (a complete list).

Venkatraman teaches accessing connected home devices using Web technology so that access is independent of an operating system platform and browser software, as well as independent of the location of the user (Venkatraman column 2 lines 36-42). Venkatraman also teaches generating a web page dynamically to reflect the updated state of the information pertaining to a device maintained by a monitor (Venkatraman column 3 lines 33-36), suggesting autonomous generation since it is dynamically updated without user help,

providing the benefit of automatic updating to reflect changing device parameters (compare with claim 1 "*... in an autonomous and dynamic manner*").

Venkatraman teaches a self contained home network comprising inter-communication links and a web browser enabling communication with a set of devices (Venkatraman Figures 2, 3, column 3 lines 33-40, column 5 lines 29-40, 46-51; compare with claim 1 "*creating a device link page*"). Venkatraman also teaches a textual representation of a corresponding connected device (a printer name) (Venkatraman Figure 3 item Printer Name, Portdv9; compare with claim 1 "*at least one graphical or textual representation of corresponding devices*").

Venkatraman teaches a set of user interface functions written in HTML, said functions associated with a device on a network (Venkatraman Figure 3, column 5 lines 36-42; compare with claim 1 "*associating a hyper-text link with each device representation....that is associated with the device representation*"). Venkatraman also teaches a Web page contained in the associated device (Venkatraman Figure 1B items 10, 18, which is indicative of device item 10 in Figure 2; compare with claim 1 "*contained in the device*").

Venkatraman teaches display of device information on a network browser (Venkatraman Figure 3; compare with claim 1 "*displaying the device link page on a browser based device.*").

In regard to dependent claim 3, Venkatraman teaches a home device connected to a home network, as well as a link page. Venkatraman does not specifically teach associating/retrieving a logical name stored in a device link file, as well as icons. However, Hanson teaches a listing of available devices, each device comprising a logical name (i.e. HDE/Meister, HDE/Gerry), to which a device is user selected and is represented by various GUI buttons associated with a status icon (Hanson Figures 3-5, column 5 lines 25-40; compare with claim 3). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Hanson to Venkatraman, because of Hanson's taught advantage of user selection, providing Venkatraman a way to customize a home network.

In regard to dependent claim 4, Venkatraman teaches a home device connected to a home network, as well as a link page. Venkatraman does not specifically teach associating/retrieving a logical name stored in a device link file, as well as icons. However, Hanson teaches a listing of available devices, each device comprising a logical name (i.e. HDE/Meister, HDE/Gerry), to which a device is user selected and is represented by various GUI buttons associated with a status icon (Hanson Figures 3-5, column 5 lines 25-40; compare with claim 4). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Hanson to Venkatraman, because of Hanson's taught advantage of user selection, providing Venkatraman a way to customize a home network.

In regard to dependent claim 6, Venkatraman teaches a home based network enabling a web browser to access user interface functions via URL's, said URL's can be embedded within an appliance (Venkatraman column 5 lines 29-42, column 8 lines 1-8; compare with claim 6).

In regard to dependent claim 8, Venkatraman teaches a method whereby web server queries a device, and in response, the targeted device transfers an HTML file that defines its device web page (Venkatraman column 7 lines 37-46; compare with claim 8).

11. **Claims 5, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Venkatraman and Hanson as applied to claim 1 above, and further in view of Reber et al. (hereinafter Reber), U.S. Patent No. 5,398,726 issued August 1999.**

In regard to dependent claim 5, Venkatraman teaches a user defined area (Venkatraman Figure 3). Venkatraman does not specifically teach a method of receiving a device logo from a home device. However, Reber teaches a method of displaying a graphical logo relating to a device onto a browser screen (Reber Figure 3; compare with claim 5). It would have been obvious to one of ordinary skill in the art at the time of the

invention to apply the logo method of Reber to the list and button GUI of Venkatraman/Hanson, because of Reber's taught advantage of graphical logos, providing increased device recognizability to the method as taught by Venkatraman/Hanson.

In regard to dependent claim 7, Venkatraman teaches a user defined area (Venkatraman Figure 3). Venkatraman does not specifically teach a method of receiving a device logo from a home device. However, Reber teaches a method of displaying a graphical logo relating to a device onto a browser screen (Reber Figure 3; compare with claim 7). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the logo method of Reber to the list and button GUI of Venkatraman/Hanson, because of Reber's taught advantage of graphical logos, providing increased device recognizability to the method as taught by Venkatraman/Hanson.

12. **Claims 9-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Venkatraman and Hanson as applied to claim 1 above, and further in view of Suzuki et al. (hereinafter Suzuki), Teleoperation of multiple robots through the Internet, IEEE Robot and Human Communication, November 11-14, 1996, pp. 84-89.**

In regard to dependent claims 9, 10, 11, Venkatraman does not specifically teach updating device list files as devices are connected and/or disconnected. However, Suzuki teaches operation of devices via the Internet, whereby calls are made to robots. All robots that respond (or indicate they are busy) are obviously connected, and the system makes note of the robots which do not return replies (i.e. disconnected, or broken etc.) (Suzuki page 87 left column item 8, also page 88 section 5.3 "An Examination of Teleoperation"). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Suzuki to Venkatraman, Providing Venkatraman the benefit of keeping track of devices.

In regard to dependent claim 12, Venkatraman teaches network location of a device (Building 1U), (Venkatraman Figure 3 item 64). Venkatraman does not specifically teach availability of connected devices. However, However, Suzuki teaches operation of devices via the Internet, whereby calls are made to robots. All robots that respond are obviously connected, and the system makes note of the robots that indicate they are busy (Suzuki page 87 left column item 8, also page 88 section 5.3 "An Examination of Teleoperation"). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Suzuki to Venkatraman, Providing Venkatraman the benefit of keeping track of devices.

In regard to dependent claims 13, 14, 15, Venkatraman does not specifically teach updating device list files as devices are connected and/or disconnected. However, Suzuki teaches operation of devices via the Internet, whereby calls are made to robots. All robots that respond (or indicate they are busy) are obviously connected, and the system makes note of the robots which do not return replies (i.e. disconnected, or broken etc.) (Suzuki page 87 left column item 8, also page 88 section 5.3 "An Examination of Teleoperation"). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Suzuki to Venkatraman, Providing Venkatraman the benefit of keeping track of devices.

13. **Claims 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Venkatraman in view of Hanson, and further in view of Suzuki.**

In regard to independent claim 16, claim 16 incorporates substantially similar subject matter as claimed in independent claim 1, and in further view of the following, is rejected along the same rationale.

Vekatraman does not specifically teach menu creation for selecting devices as presently claimed. However, Suzuki teaches a browser device interface depicting images from two robot devices in a room. Suzuki also teaches a "Dialogue Window" for entering commands to a particular device identified via identifiers (Suzuki page 87 Figure 4, also column 2 near middle - "**CmCd01", and page 88 Figure 6). In addition, Suzuki

teaches presentation of images from each connected robot, along with a "Dialogue Window" for inputting commands directed to specific devices (Suzuki Figure 4), therefore indicative of a menu selection presentation (compare with claim 16 "*creating a menu page, the menu page containing at least one of a graphical and/or textual representations of said home devices that are currently connected to said home network*"). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Suzuki to visualize Venkatraman's device list file, providing a user of Venkatraman the benefit of comparing and contrasting robotic characteristics for aiding in a user's eventual decision.

In regard to dependent claim 17, Venkatraman teaches a user interface device for presentation of a home page with selectable urls (Venkatraman Figure 3).

In regard to dependent claim 18, Venkatraman does not specifically an image icon with a graphical representation of a home device. However, Hanson teaches a listing of available devices, each device comprising a logical name and associated with an image (Hanson Figures 3-5). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Hanson to Venkatraman, because of Hanson's taught advantage of user selection, providing Venkatraman a way to visually customize a home network.

Venkatraman does not specifically teach said image file originating from a home device. However, Suzuki teaches images originating from each robot device connected to a network (Suzuki page 87 Figure 4, page 88 Figure 7). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Suzuki to Venkatraman, providing Venkatraman the benefit of visually displaying representative images originating from connected devices.

In regard to dependent claim 19, Vekatraman teaches a logical device name (Venkatraman Figure 3 "Portdv9"). Venkatraman also teaches embedding web access in an appliance, whereby access to user interface functions for a device is attained through a device web page located within said device, said page activated via

hyperlink (Venkatraman Abstract, also column 3 lines 17-25, 28-50), which is an indication of an IP address associated with said device.

In regard to independent claim 20, claim 20 incorporates substantially similar subject matter as claimed in independent claim 16, and is rejected along the same rationale.

Response to Arguments

14. Applicant's arguments filed 1/13/2005 have been fully and carefully considered but they are not persuasive.

Applicant argues that the Office Action states that Venkatraman does not teach autonomously and dynamically identifying and locating devices. It is respectfully noted that Venkatraman teaches a dynamically updated Web page for devices, including control buttons for controlling device functions. Displaying printers that are available can be reasonably interpreted as currently connected. Additional support can be found in Hanson Figures 3, and 4, which shows an option for selection of available printers over a network. Figure 3 also shows a printer status button, providing a reasonable suggestion to the skilled artisan, current connectivity of devices, since a printer must be connected in order to ascertain its status (i.e. Figure 4, "IDLE").

Applicant argues that Hanson shows a GUI list of available printers, not a device list file that identifies home devices currently connected to a network. The examiner notes that showing printers that are available can be reasonably interpreted as currently connected. Additional support can be found in Hanson Figures 3, and 4, which shows an option for selection of available printers over a network. Figure 3 also shows a printer status button, providing a reasonable suggestion to the skilled artisan, current connectivity of devices, since a printer must be connected in order to ascertain its status (i.e. Figure 4, "IDLE").

Applicant additionally argues that Applicant's claimed device link file includes logical device names, as opposed to Hanson's cited teaching. The examiner notes that Hanson teaches a listing of available devices, each

device comprising a logical name (i.e. HDE/Meister, HDE/Gerry). In additional support of the instant rejections, Venkatraman teaches a Printer Name "Portdv9", which can be reasonably interpreted as a logical device name. Since Venkatraman also teaches a dynamically updated Web page for devices, including control buttons for controlling device functions (Venkatraman column 3 lines 33-40), said Web page generally comprises an HTML file containing at least code for presentation, therefore, Hanson's object list file can be added to Venkatraman's HTML file and resulting page.

Applicant argues that Venkatraman does not teach a hypertext link associated with each device representation. The examiner notes that Venkatraman teaches links (Venkatraman column 5 lines 39-40), as well as links associated with a device on a Web page (Venkatraman Figure 3 items 66-68).

Applicant argues that there is no suggestion from either reference that they be combined or modified as proposed by the Office Action. The Examiner notes that Venkatraman teaches embedding Web access in an appliance for user interface functions utilizing a Web browser and Web page, for the purpose of accessing user interface functions through said page (Venkatraman Title and Abstract). Although Venkatraman does not specifically teach a device link file, Hanson teaches a dynamic device driver utilizing the Internet, and a WWW server, allowing for two-way communication between peripheral devices and an operating system (Hanson Figure 1 items 30, 36, also item WWW Server). Hanson teaches a status monitor object which displays a GUI object list (a device link file) of available devices (printers) for user selection (Hanson column 5 lines 35-43). In support of the Examiner's rejection, Hanson itemizes its devices via a presented list, providing Venkatraman with an itemized list of devices. This allows a user to easily see all connected devices.

Applicant argues that Reber does not teach the claimed limitations, and that there is no motivation to combine Reber with Venkatraman/Hanson. The Examiner notes that Venkatraman teaches a user defined area (Venkatraman Figure 3). Venkatraman does not specifically teach a method of receiving a device logo from a home device. However, Reber teaches a method of displaying a graphical logo relating to a device onto a browser screen (Reber Figure 3). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the logo method of Reber to the list and button GUI of Venkatraman/Hanson, because of

Reber's taught advantage of graphical logos, providing increased device recognizability to the method as taught by Venkatraman/Hanson.

Conclusion

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William L. Bashore whose telephone number is (571) 272-4088. The examiner can normally be reached on 11:30am - 8:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Feild can be reached on (571) 272-4090. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

16. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

William L. Bashore

WILLIAM L. BASHORE
PRIMARY EXAMINER

May 11, 2005

Form PTO-1449

INFORMATION DISCLOSURE CITATION IN AN APPLICATION

(Use several sheets if necessary)

ATTY DOCKET NO.	APPLICATION NO.
SAM1.PAU.14	09/104,297
APPLICANT: Richard HUMPLEMAN *et al.*	
FILING DATE: June 24, 1998	GROUP: 2176

U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	Kind	DATE	NAME	CLASS	SUB CLASS	FILING DATE IF APPROPRIATE
WG	US 5,457,446	A	Oct. 10, 1995	YAMAMOTO			

FOREIGN PATENT DOCUMENTS

	Office	DOCUMENT NUMBER	Kind	DATE	COUNTRY	CLASS	SUB CLASS	TRANSLATION YES	TRANSLATION NO
WG	EPO	EP 0 745 929	A1	04 Dec. 1996	EPO				

OTHER DOCUMENTS (Include Name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.

WG	A.K. LARSEN, *The Next Web Wave: Network Management,* Data Communications, McGraw Hill, New York, US, vol. 25, no.1, January 1996, pp. 31-32, 34.

EXAMINER: William L. Bashore — DATE CONSIDERED: 5/11/2005

EXAMINER: Initial if citation considered, whether or not citation is in conformance with M.P.E.P. 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

KLS/san
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Notice of References Cited	Application/Control No. 09/104,297	Applicant(s)/Patent Under Reexamination HUMPLEMAN ET AL.	
	Examiner William L. Bashore	Art Unit 2176	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-			
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
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	H	US-			
	I	US-			
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	K	US-			
	L	US-			
	M	US-			

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Thomas, Peter J. et al., A Framework For The Development Of Information Appliances, ACM Symposium on Applied Computing, February 1995, pages 396-400.
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

A FRAMEWORK FOR THE DEVELOPMENT OF INFORMATION APPLIANCES

Peter J. Thomas, John F. Meech and Robert D. Macredie
Centre for Personal Information Management
University of the West of England, Bristol, UK

Keywords: information appliances, personal information management, mobile/personal systems

Abstract

This paper provides a framework for the design and development of personal information appliances - interactive technologies which aim to assist users in managing personal information in organisational, group and environmental contexts. The emphasis is on integration, both in terms of the development of integrated families of appliances and in terms of way in which appliances provide an integration of the diverse media necessary to support the management of personal information.

Introduction: 'Personal' Computing

There has been considerable research effort in recent years towards the development of innovative personal [1], mobile [2, 3, 4] and ubiquitous [5] computing technologies. The primary concern in this work is the use of advanced human interface techniques to allow users to bridge the gap between the 'digital world' and the 'real world' of users' activities [6, 7, 8, 9].

These research efforts have paralleled the ways in which the concerns of large-scale information engineering and software development have – via the development of applications for desk-based PCs – been refocused on the 'personal' in personal computing [10, 11]. One recent manifestation of this focus has been 'personalised' technology in the form of personal digital assistants (PDAs). The last few years have seen several PDA devices appear which have targeted mobile workers who need to take information out of the office and into their home, car or around their organisations.

Such devices, which would appear to be a valuable addition to users' technological armoury, have overwhelmingly failed to gain user acceptance, rather being seen as 'technological fixes' to the problem of managing information. There are at least three criticisms which can be levelled at such devices:

(a) There has been little attempt to develop a body of knowledge and concepts regarding the nature of the process of managing information at a personal level. In the absence of such a body of knowledge the design of such technology is often based on *prima facie* assumptions about the nature of managing personal information, the context in which it occurs, and the way in which technology can support it;

(February 1995)

(b) There have been few attempts – beyond providing technical solutions to connectivity problems – to provide for *integration* between different technologies, and between the technologies and the activities they aim to support. Many current devices, far from being integrated into the 'global digital medium', are only loosely connected with other devices which enable users to manage their personal information;

(c) The conceptualisation of personal technology (in terms of 'personal digital assistants' for example) employs metaphors which may be inappropriate for the possible uses (and limitations on the uses) of that technology. Simply developing mobile technology and suggesting that it is therefore 'personal' is not likely to be successful, either in terms of gaining user acceptance or in supporting the creative development of useful and usable devices [12].

Devices for managing personal information are better viewed as *personal information appliances* which are integrated into an 'appliance family', and which integrate several forms of user interaction and interface media, can serve several information management roles, and which are based on an understanding of the details of the work of managing personal information.

A Framework for Personal Information Appliances

The development of mass-market personal devices and the efforts of advanced human interface research can equally benefit from an organising framework in which to consider the development of personal devices (figure 1). The key concerns are (a) how such devices will integrate with each other, (b) how they will integrate with the existing physical environment of the user, and (c) how they will integrate with users' 'personal information management' practices.

'Personal information management' [13, 14, 15, 16] is a complex and varied task which requires not only the use of different technologies, media and modalities but the integration of technologies, media and modalities for information storage, and user input and output [17, 18, 19, 20, 21].

Part of the framework for the design of personal information appliances is therefore a *specification of the range of personal information management activities* which are supported. These activities are essentially:

1. *Storage* of local information created or manipulated by users;
2. *Retrieval* of local and non-local information;
3. *Integration* of multiple sources of local and non-local information;
4. *Decision-making* by linking stored, retrieved and integrated information;
5. *Communication* with other users and devices.

09/104,297

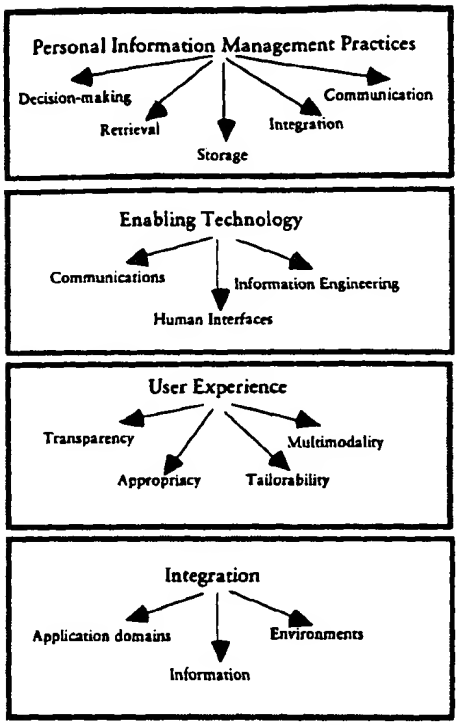

Figure 1: a framework for the development of information appliances. Key factors - Practices, Technologies, Users and Integration.

One of the problems with devices such as PDAs and the software applications they support is that very little consideration of the nature of sophisticated personal information management practices find their way into designs beyond user-interface engineering considerations. Any effective approach to supporting the management of personal information will need to take account of these sophisticated practices as drivers for the development of technologies to support them. The overall aim is to make information readily available, connectable, easily manageable and to reduce redundancy. Support of personal information management through technology requires devices which carefully take into account not only the range of activities but the links between those activities and the various modalities and media which can support them.

The second part of this framework is a *specification of users' experience of personal information appliances*. One formulation of this is:

> *Transparency.* Access to information is transparent, and appliances are interchangeable;
>
> *Appropriate information provision.* The focus is not only on the bandwidth of information or simply multimedia delivery, but on the provision of information which is appropriate to the task at hand;
>
> *Radically tailorable enduser interfaces.* Interfaces to personal appliances are driven by the contextual features of use and the content of information [22, 23, 24, 25];
>
> *Multimodal interfaces.* User interfaces to appliances use several forms of flexible multimodal presentation.

The third basis for the organising framework is to *specify the nature of integration*. There are several senses of integration which are important to distinguish:

> *The integration between various application domains* of personal information devices;
>
> *The integration between different types of information* and the means by which it is manipulated. 'Multimedia computing' is one term that has been used to reflect the integration between different media and modalities, but a better term might be *multimodal technology*: capable of being used in many modes, and providing not just multiple media but integrated media;
>
> *The integration of appliances into an information environment.* The move toward incorporating cellular communications and the use of removable and interchangeable media such as PCMCIA cards is one possibility, but typically this only means integration with other cellular or PCMCIA-enabled devices. What is required is an integration of the PDA into other *information roles* and other *information media*.

The fourth part of the framework is to *specify enabling technology developments* which support the development of appliances (figure 2):

> *Communications and Network Technologies.* Spectrum-efficient networks, infrastructures and equipment; the integration of networks and services; mobile broadband services; personal communications services; wireless personal communications networks;
>
> *Human Interfaces.* The design of information displays; multimodal interfaces; the use of 'digital documents'; open technologies for data storage and retrieval; video/voice integration; small and innovative display devices; and more generally the integration of information media [26];
>
> *Information Engineering.* Support for mobile professionals and knowledge/information workers; satellite offices; Business Process Re-Engineering and the virtual corporation; integrated office information systems; and techniques for managing 'interpersonal information management' [27].

TASKS	INTERFACE TECHNOLOGIES	INFORMATION APPLIANCES
Storage Retrieval Decision support Integration Communication	Agents GUI Pen Voice/speech Sound Gesture	Badges SmartPhones SmartCards PDAs Office information managers Intelligent Site Appliances Personal Digitisers Noserakers Vade Mecum
DOMAINS Site/building systems Home Systems Office Systems Mobile Systems	COMMUNICATIONS LAN Telephony IR RF Satellite Cable	

Figure 2: appliances, communications and interface technologies

Finally the framework should *specify the relationship between the various application domains and appliances*. We suggest that the relationship is not between specific appliances and

domains, but between domains and *families* of information appliances.

Families of integrated personal information appliances include familiar technologies and appliances but also radically new appliances. Figure 3 shows one mapping of the space of families of personal information appliances into application domains, and the overlapping relationships between application domains and families of appliances:

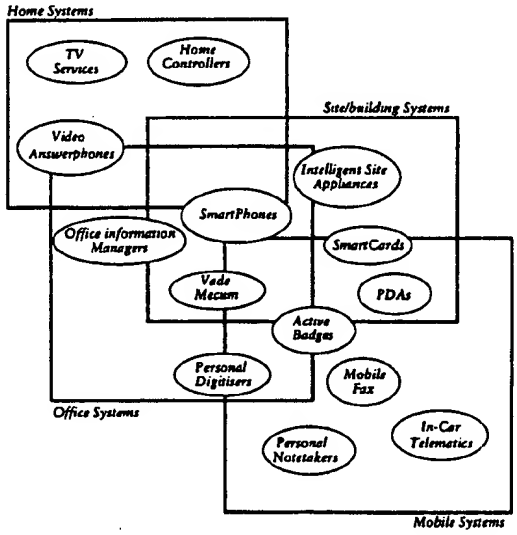

Figure 3: Personal Information Appliances (adapted from [20])

A Review of Personal Information Appliances

We have discussed in general terms a framework for considering the development of personal information appliances. We are currently using this framework to drive the design and development of families of appliances and individual members of those families. We will briefly review some of these from the perspective of *application domain* (site/building systems), *appliance family* (Smartcards and Telephony appliances) and *user interface technology* (agent-based appliances).

Site and Building Systems. Except for sophisticated evaluation and test sites, 'intelligent' site/building management has predominantly been focused on environmental control, access/egress control and activity monitoring. The development of integrated personal information appliances suggests an integration of 'bits and buildings' and the integration of information appliances into sites and buildings themselves. One scenario is to embed information management facilities into buildings via distributed appliances which interface with other appliances, the process managed by agents which reside in each networked appliance. These may be PDAs, but also smaller appliances such as active badges, portable computers connected to LANs, telephone handsets or voicemail systems. Agent-based fax or call routing devices can direct information appropriately and help users manage it by tailoring messages (for example a room booking agent detects that activities cannot be interrupted, and information can be stored and/or forwarded to the user's future location at a specific time). Intelligent site/buildings and their appliances are integrated with wider information sources (such as proprietary networks or the Internet), and in-car telematics appliances can choose to direct information back to home base.

Smartcards. For some personal information management activities, the point of immediate interface with information is a smartcard which carries the data about the user (allowing users access to services such as banking, building access, public utility account information and payment). The issue of transparency is central here since users of these cards typically find that several cards need to be carried as interfaces to different services. Considered as personal information appliances, these cards have the potential to act as information management appliances rather than merely data carriers. For example one form of the smartcard can provide its user with access to in-car telematics systems and site information; another is an 'electronic business card' which contains details of the user's business credentials (a CV, biographical description, photograph, details of home telephony, fax or voicemail systems, or native language). A user moving between sites, or between areas of site (when 'hotdesking' for example) uses the card as a transparent interface to another information management devices such as PDAs, telephone handsets or deskbound PCs.

Telephony appliances. Telephony systems are still, despite massive developments in enabling network technologies, relatively simple and reactive information appliances. The use of voicemail – ubiquitous within many organisations – call management or fax-switching, are familiar services which can be enhanced by a perspective which emphasises integrated personal information appliances. The requirement for transparency suggests that telephone handsets can be access points to information and enhanced with software links to deskbound or portable pen-driven text entry pads, PDAs, or smartcards. Similarly, cellular telephone handsets, which currently are only tenuously integrated with other appliances such as PCs or faxes on digital networks, can be used to access and manage more sophisticated information by software bridges to printers, faxes or displays, and can be used to integrate with in-car telematics systems, building/site information management systems and radio networks by docking with other appliances.

Agent-based appliances. 'Intelligent agents' have for some time been a focus for work in advanced human-computer interface research. Sadly, such work has failed to deliver significant advantages. This is perhaps because the focus has been on the 'intelligent' in intelligent agents, rather than on the notion of 'agency' itself. The concept of agency in terms of managing information may best be thought of as an *enabling functionality*. In these terms an agent may be seen as providing a special facility such as scheduling meetings to a particular user's preferences [28, 29], or performing other functions in much the same way as a human might. These agent roles may be viewed as functioning at the information level: they manage information within the context of human understanding. A more appropriate approach is that information appliances host controllable, minimal, 'information management support agents'. One scenario is where agents residing in information appliances (faxes, telephone handsets, networks, in car-telematics systems or PDAs) provide low-level information management services such as store and forwarding of information based on simple preferences. Simple agents can populate the information space of telephony systems and help

users manage information through low-level communication between building zones, providing call forwarding, links between telephony and pagers to appropriately route information across organisations and deliver it in appropriate media (visual, auditory, multimedia document-based).

Conclusion

This paper has provided a general view of the issues in developing personal information appliances. It is clear that there are complex and difficult issues to be resolved to enable the development of usable appliances. Some of these are at the level of *communications infrastructure* (in terms of the efficient and robust integration between communications technologies and protocols), *usability* (the development of effective human interfaces to appliances, and the problems of ensuring a smooth and uniform interface representation across appliances and tasks) and the *social* (the effect of providing appliances which constantly sense and monitor the user's location and activities, for example or the effects of supporting 'informal communication' in the workplace – [30]).

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